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DAVID J COLE E INK CORPORATION 733 CONCORD AVE CAMBRIDGE, MA 02138-1002			TSOY, ELENA	
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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/711,278
Filing Date: September 07, 2004
Appellant(s): HONEYMAN ET AL.

MAILED
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David J. Cole
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 24, 2006 appealing from the Office action mailed October 31, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,750,258	SAKAI ET AL	5-1998
4,663,265	UYTTERHOEVEN ET AL	5-1987
6,103,380	DEVONPORT	8-2000
6,121,371	MATYJASJEWSKI ET AL	9-2000
6,514,328	KATOH ET AL	2-2003
3,884,871	HERMAN ET AL	5-1975

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

ClaimS 1, 8-11, 14, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devonport (US 6,103,380) or Sakai et al (US 5,750,258) in view of Uytterhoeven et al (US 4,663,265).

Sakai et al discloses a process for producing crosslinked resin-coated silica fine particle (claimed pigment particles) comprising reacting the silane portion of the vinyl-containing silane coupling agent such as vinyltrimethoxysilane, vinyltriethoxysilane (See column 5, line 20) with the silanol group on the calcined silica fine particle to form a chemical bond (claimed covalent bond), then reacting the vinyl group of the silane coupling agent with the unsaturated double bond of a monomer mixture comprising a monofunctional vinyl monomer (M) and a polyfunctional vinyl monomer (P) with P/M molar ratio of 70/30 mol (See column 7, lines 49-56), for forming the crosslinked resin coating when the monomers are polymerized, to form a chemical bond, whereby a crosslinked resin coating excellent in adhesion is formed on the surface of each calcined silica fine particle through the vinyl-containing silane coupling agent (See column 4, lines 53-67; column 5, lines 1-15, 38-39). The coated silica particles may be further coated with a resin layer (See column 15, lines 27-54) of same kind or *different* kinds (See column 5, lines 52-58). The crosslinked resin coated silica particles can be dispersed in a liquid crystal medium (See column 12, lines 1-6) for the use in liquid crystal display (See column 12, lines 14-15). The crosslinked resin-coated silica fine particles of the present invention have characteristic features in that the *peeling* of the resin coatings substantially do not occur when they are dispersed in a dispersing medium with ultrasonic vibration (See Abstract). The polyfunctional monomers include acrylates and methacrylates of polyhydric alcohols, polyethylene glycol dimethacrylate (claimed monomer having a chain of at least about four carbon atoms attached to a polymerizable group) etc. (See column 8, lines 33-43) (i.e. the polymer formed on the particles would comprise a main chain and a plurality of side chains extending from the main chain, each of the side chains comprising at least about four carbon atoms). The polyfunctional monomers include hydrophilic monomers (See column 12, lines 34-

Art Unit: 1762

42) or hydrophobic monomers such as vinyl aromatic hydrocarbons (styrene, alpha-methylstyrene, etc.) (See column 12, lines 42-46). Sakai et al further teach that when the amount of the silanol groups on the surfaces of the calcined silica fine particles is insufficient (i.e., when the amount of the vinyl groups to be introduced onto the surfaces of the silica fine particles by reacting with the vinyl-containing silane coupling agent becomes insufficient), preferably, silicon tetralkoxide (See column 10, lines 12-15) is allowed to react with the calcined silica fine particles to introduce silanol groups onto the surfaces of the calcined silica fine particles, whereby the amount of reactive sites for the vinyl-containing silane coupling agent is increased to introduce a necessary amount of vinyl groups (See column 9, lines 57-67). The silicon alkoxide treatment may be carried out before the coupling agent treatment (See column 10, lines 51-52). Thus, the silane coupling agent can be covalently attached directly to the silica particles or through a disiloxane layer formed by reaction of the silane coupling agent with hydroxyl groups of hydrolyzed tetralkoxide.

Sakai et al fail to teach that the polymer-coated pigment particle may be used for forming an electrophoretic medium by dispersing into a suspending fluid.

Uytterhoeven et al teach that polymer coated pigment particles capable of being charged, e.g. as charged toner particles for dispersing in a liquid electrophoretic medium (See column 1, lines 6-11, 40-43; column 2, lines 46-62). Uytterhoeven et al teach that prior art used as dispersion stabilizing agent a specific block copolymers comprising a polymer part A being an adsorbent group for the pigment particles to be dispersed and at least one polymer part B that is solvatable by the carrier liquid (See column 2, lines 13-26). Since block copolymers are not easy to make, Uytterhoeven et al offer to use two polymer layers A-B, wherein polymer A which forms a coating on the pigment particles has a poor solubility in said liquid and a polymer B, which is chemically linked to the polymer A, has a good solubility in said liquid (See column 2, lines 50-62). As was discussed above, particles of Sakai may be coated with either a single layer of A-B block structure, where a polymer of e.g. vinyl aromatic monomers (B portion solvatable in non-polar liquid) is connected to the particles through hydrophilic disiloxane layer (A portion poorly solvatable in non-polar liquid) or as two polymer layer A-B, where A is a first layer of a hydrophilic polymer and a second layer of a different resin, e.g. hydrophobic resin. Since Sakai et al teach that a single layer is not peelable in a liquid medium due to covalent bonding, it could

Art Unit: 1762

be assumed that non-peelable two polymer layers also connected to each other. One of ordinary skill in the art would reasonably expect that particles of these structures would form stable dispersions in a non-polar solvent since A-B structure of Sakai where B is hydrophilic can be dispersed stably in polar solvent (See column 18, lines 45-47).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used pigment particles of Sakai et al coated with either a single layer of A-B block structure or two polymer layer A-B for forming an electrophoretic medium by dispersing into a suspending fluid since Uytterhoeven et al teach that pigment particles coated with coatings of similar A-B structure are chargeable and can be used for forming an electrophoretic medium by dispersing into a suspending fluid.

Claims 1, 8, 11-13, 19, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devonport (US 6,103,380) in view of Uytterhoeven et al.

Devonport discloses a method for modifying surface of particles such as carbon black and using such modified particles (See column 1, lines 6-11), e.g. for dispersing in ink compositions (See column 10, lines 35-36) or can be used as toners (See column 10, line 37) Devonport discloses in the Background of the Invention that a process for producing a polymer-coated carbon black (claimed pigment) particle comprising growing polymers (with at least one monomer or oligomer) from an activated carbon black surface by first attaching a reactive group via the oxygen groups on the carbon black surface by using glycidyl methacrylate where the glycidyl group reacts with phenolic hydroxyl groups on the carbon black surface providing a vinyl functionality (for claimed radical polymerization); the reaction of 4,4'-azo bis-(4-cyanovaleric acid) whereby the isocyanate group reacts with phenolic hydroxyl groups and subsequent heating decomposes the azo group to generate an alkyl radical (claimed polymerization initiating group); and the reaction of the phenolic hydroxyl groups with butyl lithium which can then be used as an initiation site (claimed polymerization initiating group) for anionic polymerization (See column 1, lines 33-41) thereby causing the formation of polymer (covalently) bonded to the particle, was known in the art. However, polymers can be attached carbon black using different techniques. The polymers may include polymers of styrene, methylstyrene, isoprene, butadiene (See column 8, lines 47-53). Thus, coating on particles of

Art Unit: 1762

Devonport may be represented as having A-B structure having portion A formed by reaction of glycidyl group with phenolic hydroxyl groups (poorly solvatable in non-polar liquid) and B portion formed by polymers of styrene, methylstyrene, isoprene, butadiene (solvatable in non-polar liquid).

Devonport fails to teach that the polymer-coated pigment particle may be used for forming an electrophoretic medium by dispersing into a suspending fluid.

Uytterhoeven et al are applied here for the same reasons as above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used pigment particles of Devonport coated with A-B layer for forming an electrophoretic medium by dispersing into a suspending fluid since Uytterhoeven et al teach that pigment particles coated with coatings of similar A-B structure can be used for forming an electrophoretic medium by dispersing into a suspending fluid.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have made polymer-coated pigment particle of Devonport for the use in an electrophoretic medium by dispersing into a suspending fluid since Uytterhoeven et al teach that polymer-coated pigment particle may be used for forming an electrophoretic medium by dispersing into a suspending fluid.

As to claim 12, Devonport teaches that polymer-coated carbon black can be produced by chemically attaching (See column 8, lines 36-41) groups of formula (II) containing labile halide (See column 2, lines 38-54) such as benzyl chloride (See column 6, line 56) which permits the formation of radical groups (See column 6, lines 46-48), then reacting these groups with a polymerizable monomer thereby attaching polymers to the attached groups (See column 8, lines 47-62).

As to claim 13, the polymerization reaction thus can produce any length of polymer on the modified particle; and the polymers can be any type, such as homopolymers, co-polymers, ter-polymers, or higher chain polymers, and also can be block, graft, or random-type polymers (See column 9, lines 27-34). It is well known in the art that a block polymer is made by sequentially adding monomers: adding a second monomer after stopping polymerization of a first monomer.

Art Unit: 1762

As to claims 19, 20, silica-coated carbon product can also be used as the particle (See column 5, lines 53-54).

Claims 13, 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devonport in view of Uytterhoeven et al, further in view of Matyjaszewski et al (US 6,121,371).

Devonport view of Uytterhoeven et al are applied here for the same reasons as above. Devonport further teaches that the polymers can be of any type, such as homopolymers, co-polymers, ter-polymers, or higher chain polymers; and they can also be block, graft, or random-type polymers (See column 9, lines 30-34). Devonport view of Uytterhoeven et al fails to teach that: a block polymer can be made by adding a second monomer after stopping polymerization of a first monomer (Claim 13); the polymerization is carried out with wherein a monomer comprising a group capable of initiating polymerization but which essentially does not initiate such polymerization under the conditions used for polymerization of a first monomer, and following this step, the polymer-bearing particle is contacted with a monomer under conditions which cause the group capable of initiating polymerization to initiate polymerization of the monomer, thereby causing the formation of a branched-chain polymer on the particle (Claims 15, 16).

Matyjaszewski et al teach that any type of polymers including block, branched and comb polymers can be prepared using radical polymerization initiator (See column 1, lines 6-10):

block copolymers can be prepared using a pre-formed macroinitiator to initiate the polymerization by sequential addition of monomer: upon the consumption of all or most of a first monomer, a second monomer is added which is then added to the polymer chain (See column 7, lines 45-64);

branched and hyperbranched polymers can be prepared by (co)polymerization of AB* monomers. Such monomers have a polymerizable double bond (A) and a functional group that can initiate ATRP (B*), e.g. a radically transferable atom or group (See column 7, lines 65+); and

comb shaped polymers can be prepared from macroinitiators that contain a free radically transferable atom or group on each monomer unit, or regularly along the polymer chain, such

Art Unit: 1762

that the branches or grafts are forced to physically interact at a molecular level (See column 8, lines 16-24).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have coated a particle in Devonport view of Uytterhoeven et al using techniques of Matyjaszewski et al with the expectation of providing the desired coating of block, branched, or comb polymer, since Devonport further teaches that the polymers can be of any type, such as homopolymers, co-polymers, ter-polymers, or higher chain polymers; and they can also be block, graft, or random-type polymers, and Matyjaszewski et al teach that any type of polymers including block, branched and comb polymers can be prepared using radical polymerization initiator.

Claims 35-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katoh et al (US 6,514,328) in view of Sakai et al.

Katoh et al disclose a process for producing a polymer-coated pigment powder 20 for dispersing into a suspending fluid to form an electrophoretic medium or liquid crystal device (See column 1, lines 16-20). The process comprises *covalently bonding* a polymeric layer 21 (See column 17, lines 22-23) such as polymethylacrylate (See column 17, lines 7-8) to the surface of the pigment powder 20 by coating (See column 17, lines 15-21), chemical adsorption using a silane coupling agent such as vinyltriethoxysilane (See column 17, lines 42-43) or graft polymerization (See column 17, lines 28-30) or combination thereof (See column 18, lines 16-21). The pigment includes titanium oxide (See column 17, lines 4-5) or titanium oxide coated with a silicon oxide (See column 17, line 6).

Katoh et al fail to teach that a polymer coating is formed on the surface by copolymerization of a monomer with a polymerizable group of the silane coupling agent.

Sakai et al teach that a polymer layer can be covalently bonded to the surface of a silicon oxide for the use in a liquid crystal device by reacting the silane portion of the vinyl-containing silane coupling agent such as vinyltriethoxysilane (See column 5, line 20) with the silanol group on the silica fine particle to form a chemical bond (claimed covalent bond), then reacting the vinyl group of the silane coupling agent with the unsaturated double bond of a monomer mixture comprising a monofunctional vinyl monomer (M) and a polyfunctional vinyl monomer (P) with

Art Unit: 1762

P/M molar ratio of 70/30 mol (See column 7, lines 49-56), for forming the crosslinked resin coating when the monomers are polymerized, to form a chemical bond, whereby a crosslinked resin coating excellent in adhesion is formed on the surface of each silica fine particle through the vinyl-containing silane coupling agent (See column 4, lines 53-67; column 5, lines 1-15, 38-39). The polyfunctional monomers include acrylates and methacrylates of polyhydric alcohols, polyethylene glycol dimethacrylate (claimed monomer having a chain of at least about four carbon atoms attached to a polymerizable group) etc. (See column 8, lines 33-43) (i.e. the polymer formed on the particles would comprise a main chain and a plurality of side chains extending from the main chain, each of the side chains comprising at least about four carbon atoms).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed a polymer layer 21 in Katoh et al by copolymerization of a monomer with a polymerizable group of the silane coupling agent as described by Sakai et al with the expectation of providing the desired excellent adhesion of the polymer layer to the surface of each pigment particle through the vinyl-containing silane coupling agent.

Claims 35-36, 39-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Herman et al (US 3,884,871).

Herman et al disclose a process for producing a polymer-coated titanium dioxide (claimed titania) pigment particles (See column 1, lines 48-52), which process comprises adding an **anchoring** agent having polar groups such as $-\text{SO}_3\text{H}$, COOH groups which are strongly adsorbed on the pigment surface (See column 3, lines 38-40) and a polymerizable group; adding a monomer such as $\text{C}_4\text{-C}_{20}$ -branched alkyl esters of acrylic acid (claimed monomer having a chain of at least four carbon atoms attached to a polymerizable group) (See column 4, lines 34-38) for copolymerization with the polymerizable group of the anchoring agent (See column 4, lines 38-46) thereby bonding the coating polymers onto the surface of the pigment (See column 3, lines 28-30). It is the Examiner's position that "*strongly adsorbed*" $-\text{SO}_3\text{H}$, COOH groups of the **anchoring** agent should be interpreted as "*chemically adsorbed*" $-\text{SO}_3\text{H}$, COOH groups because titanium dioxide surface is known to have OH-groups, and, as well known in chemistry, $-\text{SO}_3\text{H}$, COOH groups or their salts **react** with OH groups upon simple mixing.

(10) Response to Argument

Applicants' arguments filed May 24, 2006 have been fully considered but they are not persuasive.

(A) Applicants argue that there is no logical way in which a skilled person would combine Sakai and Uyterhoeven to produce a process in accordance with present claim 1. Uyterhoeven teaches that, to be useful in such an electrophoretic composition, the particle must have a specific two-part polymer structure, namely at least one polymer ("polymer A") which forms a coating on the pigment (apparently a dried physical coating, judging from the Examples of Uyterhoeven, rather than a chemically-bonded coating as in Sakai) and has poor solubility in the suspending fluid of the electrophoretic composition, and a second polymer ("polymer B") chemically linked to polymer A and having good solubility in the suspending fluid of the electrophoretic composition. The requirements for spacer particles used in liquid crystal displays are very different from those for electrophoretic particles; for example, the ability to carry an electric charge is irrelevant to the former, but crucial in the latter, while spacer particles should not be readily dispersible in the liquid crystal medium whereas electrophoretic particles need to be dispersible in the suspending fluid.

The Examiner disagrees. Coating particles to modify their surface to improve dispersibility in various liquid media is well known and conventionally used in almost all branches of industry: if the particles are hydrophobic, they are coated with a molecule having a portion fixable to the particle surface and a portion having affinity to a polar liquid medium to be dispersed in a polar liquid medium and vice versa. Sakai et al teach coated particles where coating having hydrophobic and hydrophilic portions is chemically attached to the particle surface through one portion and portions are connected to each other so that they do not peel upon dispersion in a liquid medium. Obviously, electrophoretic art would use dispersible particles from any art as long as they have required hydrophobic and hydrophilic portions including the coated particles of Sakai et al having A-B structure which are used in crystal display medium because the particles have non-peelable hydrophobic and hydrophilic portions and could be easily be charged by adsorbing oil-soluble ionogenic substances to portion B solvatable in non-polar liquid.

Art Unit: 1762

(B) Applicants assert that Devonport and Uytterhoeven et al are traversed for the similar reasons as for Sakai. The situation regarding this rejection is to the preceding rejection.

The Examiner disagrees for the same reasons as discussed above. Note that Devonport *modifies* surface of particles such as carbon black to use modified particles for **dispersing** in polymeric compositions. Both Devonport and Uytterhoeven et al make toner particles.

(C) Applicants argue that there is no logical way to combine Katoh and Sakai. Sakai is explicitly restricted to silica particles, which are shown to have the right physical properties for use as spacers in liquid crystal displays. There is no logical reason why a skilled person, seeking to improve the Katoh coated titania particles, would assume that Sakai is relevant. Sakai is concerned solely with controlling the surface properties of silica particles to render them more suitable for use as spacers in liquid crystal displays, whereas Katoh is concerned with coating titania particles to adjust their relative affinities for two immiscible suspending fluids (typically water and hydrocarbon) in an electrophoretic display. (The reference to liquid crystals in Katoh is solely by way of acknowledging prior art in the area of electro-optic displays; the Katoh displays are electrophoretic displays, not liquid crystal ones, and there is no suggestion in Katoh that liquid crystals can usefully be used as either of his suspending fluids.) Given the major differences in both the materials being coated and the liquid in which the coated particle is to be used, there is no logical reason why the skilled person would assume that the type of coating described in Sakai would be useful in the Katoh displays.

The Examiner respectfully disagrees with this argument. First of all, in contrast to Applicants argument, Katoh is concerned with a marking ink composition comprising a dye and a pigment and a **display medium** comprising marking ink composition (See column 1, lines 6-14). A liquid crystal, electrochromic device, electrophoretic migration device, and magnetic migration device are conventionally known as elements for use in the display medium (See column 1, lines 16-25).

Secondly, in contrast to Applicants argument, Katoh is concerned with coating not only of titania particles (See column 17, lines 4-5) but also titanium oxide coated with a silicon oxide (See column 17, line 6).

Therefore, there is logical reason why the skilled person would assume that the type of coating described in Sakai would be useful in the Katoh displays.

(D) Applicants argue that Herman describes a process for the coating of titania pigment particles, in which there is added to a water slurry of titania a polyanionic dispersing agent, the slurry is diluted until it contains 15 to 30% of titania, and then there is added to the diluted slurry an anchoring agent comprising an organic vinyl monomer containing polar groups which are adsorbed on to the surface of said [titania] particles (see Herman claim 1, emphasis added). The italicized wording clearly shows that in the Herman process the "anchoring agent" is simply adsorbed on to the titania surface by ionic interactions and is not bonded to the surface via a covalent bond, as required by present claims 35 and 39-40. Hence, Herman cannot anticipate any of the present claims.

The Examiner respectfully disagrees with this argument. It is the Examiner's position that "*strongly* adsorbed" COOH groups of the **anchoring** agent of Herman should be interpreted as "*chemically* adsorbed" COOH groups because titanium dioxide surface is known to have OH-groups, and, as well known in chemistry, COOH groups or their salts *chemically* adsorb on a particle surface having OH groups upon simple mixing, as evidenced by US 4,664,711 to Kawaguch et al (See column 2, lines 29-35, 50-55), and *chemical* adsorption as opposed to physical adsorption means covalent bonding, as evidenced by Katoh et al above (See Fig. 4C; column 17, lines 22-30).

For the above reasons, it is believed that the rejections should be sustained.

Art Unit: 1762

Respectfully submitted,

Elena Tsoy
Primary Examiner
Art Unit 1762
June 30, 2006


ELENA TSOY
PRIMARY EXAMINER
ETsoy

Conferees:

Timothy Meeks



Glenn Caldarola



Glenn Caldarola
Supervisory Patent Examiner
Technology Center 1700